

~~CONFIDENTIAL~~NPIC/TDS/D-1188-67
21 December 1967

MEMORANDUM FOR THE RECORD

SUBJECT: Trip Report - [REDACTED]

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1. Three members of the NPIC Technical Development Staff (TDS) visited the Electronic Products Division of the [REDACTED] on 5 December 1967, for the purpose of determining the progress being made under an active contract. Completion of this contract, let to "Study, develop and evaluate unique materials for rear projection screens", is due on 30 December 1967.

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2. The TDS members, [REDACTED] and the undersigned, were greeted by [REDACTED] in the office of the latter, where a short discussion took place relative to the initial unsuccessful attempt of [REDACTED] to obtain a unique type of screen material, known as [REDACTED]. [REDACTED] stated that he would send a second request to the firm. (Refer also to Assistant for Technical Development, NPIC, classified memorandum, file NPIC/TDS/D-1176-67, dated 11 December 1967, for additional information.)

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3. Following this informal discussion, the above named individuals proceeded to a conference room where they were joined by [REDACTED] for a formal presentation. During this presentation, the progress made toward meeting the contract specifications was disclosed in two briefings given by [REDACTED]. This information was catalogued in printed tables and graphs, copies of which are now available in our project file.

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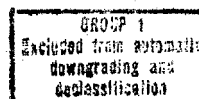
4. Basically, this presentation disclosed that the work performed by [REDACTED] has resulted in the development and evaluation of a number of improved "Discrete Particle Screens", approaching the desired characteristics, but the realization of a material meeting all of the optical properties specified in the contract has not been achieved.

5. After the presentation, [REDACTED] broached a question relative to the universality of the modulation transfer function (MTF) measurements made by [REDACTED] i.e., whether the readings obtained would be equally valid if measured on another type instrument. This resulted in the disclosure that they should, provided they were made under exactly the same conditions

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as when made in the [] laboratory. Further discussion pointed up the fact that while the MTF of a lens was a rather meaningful measurement throughout the optics discipline, the measurement of the MTF of an object such as the screen material was a subject open to debate. The [] personnel advanced the argument that the MTF measurement of the screen alone would vary from point to point across the surface of the material and, consequently, only a band of MTF measurements, when plotted as a graph, would have sensible meaning. It was agreed that more definitive terms were probably in order when specifying the required MTF for rear projection screens or similar material. 25X1

6. Upon conclusion of the discussion on MTF, [] again took the floor and talked about an effect noted during [] experiments which might well prove to be a sleeper in-so-far as development of an improved rear projection screen material is concerned. He drew attention to the fact that one of the avenues of approach toward developing a more efficient screen had been the inclusion of various densities of dye in the discrete particle coating layers. This had resulted in the knowledge that dyeing the coating had only a minor diminishing effect on the optical properties of the material. Of itself, this appeared to have little importance. Exploration of subsequently noted phenomena, however, indicated the possibility of improved conditions through the use of dyes, but not in the coating layer. 25X1
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7. [] stated that during the experiments conducted with the discrete particle screen material the coating layer was normally placed toward the observer, the supporting substrate being toward the projector. Occasionally, this condition was reversed. Observing a projected radial resolution target under the latter condition resulted in the perception of a faint halo of light around the periphery of the image. Also, when viewing a projected image, a small graduated step wedge gray scale was held in the space between the observer's eye and the screen in an attempt to determine the tonal range. While using this step wedge gray scale, it was also placed in contact with the supporting substrate of the screen material and it was discovered that, although the transmitted light composing the image was somewhat reduced, the tonal range was apparently increased over that when viewing under the previously mentioned condition. The halo effect, of course, was undesirable while the effect noted when viewing a projected image through the gray scale in contact with the supporting substrate of the screen appeared to be an asset. Scientific explanations of these two phenomena were sought.

8. It was theorized that the intensity of the directly perceived projected image light was proportional to the first power of the transmission of the screen material. Further, in the case of the gray scale in contact with the screen material, the material on which the gray scale image was imposed was itself acting as a screen and, due to the difference

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in indexes of refraction, the contact surface was acting as a reflector for the ambient light coming from the observer's direction. Thus, the ambient light was traversing the gray scale material twice, once away from the observer and once toward him. Intensity of the ambient light was then considered to be proportional to the second power of the transmission of the gray scale material. Applying similar reasoning to the observed halo effect, it was theorized that the different indexes of refraction involved were causing both surfaces of the screen substrate material to act as partial reflectors. Some of the projected light was then considered to traverse the material once from the projector side of the material, be reflected by the observer side of the material, again be reflected by the projector side of the material and exit from the observer side of the material slightly displaced from its directly transmitted path. A faint halo effect resulted, the intensity of which, due to the three traverses through the material, was considered to be proportional to the third power of the transmission of the material. Logically, the question of how these conditions could be turned to practical advantage was of concern.

25X1 9. Directing attention once again to the phenomenon noted with the gray scale, [REDACTED] pointed out that the effect appeared to be more pronounced in the more opaque steps of the scale. It was reasoned that if this effect could be obtained in the darker portions of the gray scale material, which was acting as nothing more than a secondary screen, the same effect could possibly be realized by dyeing the projection screen substrate material. Naturally, dyeing the substrate material would affect the other transmission attenuation characteristics of the screen. What, then, could be gained by dyeing the substrate?

10. Recalling that the intensity of the directly perceived projected image light was proportional to the first power of the transmission of the screen material, the intensity of the ambient light was proportional to the second power of the transmission of the screen material and the intensity of the halo light was proportional to the third power of the transmission of the screen material; it would seem that by dyeing the screen substrate material to an ideal opacity the following conditions would accrue. The directly perceived projected image light intensity would be diminished (an undesirable condition if carried too far), the ambient light intensity would be diminished (a very desirable condition) and the halo light effect would be diminished, if not eliminated, (a very desirable condition). Thus, dyeing the screen substrate material evolves into a "trade-off" problem.

11. Due to the imminent completion of the present contract by [REDACTED] investigation into the dyeing of the screen substrate could not be pursued

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further. However, this approach was conceded to be fraught with possibilities and future separate research would appear to be warranted.

12. Finally, some of the latest discrete particle screens were demonstrated in a rear view projector along with the above mentioned phenomena. Samples of these screen materials will be forwarded to the NPIC, TDS in the near future.

[REDACTED]
Imagery Systems Br/TDS

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Distribution: Orig - File
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